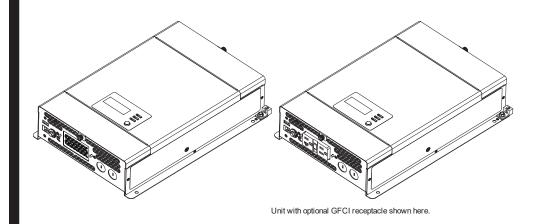
Smart choice for power*





Owner's Guide

Freedom X 1200 -120V Sine Wave Inverter

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Product Name and Part Number

Freedom X 1200 (806-1212)

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Information About Your System

F	As soon as you open	your product	record the follow	ing information	ı and be sure to	keep your proc	of of	purchase.

Serial Number	
Product Number	
Purchased From	
Purchase Date	

To view, download, or print the latest revision, visit the website shown under **Contact Information**.

Purpose

The purpose of this Owner's Guide is to provide explanations and procedures for installing, operating, configuring, maintaining, and troubleshooting a Freedom X 1200 -120V Sine Wave Inverter for Recreational, Commercial and Fleet Vehicle, or Marine installations.

Scope

The guide provides safety and operating guidelines as well as information on installing and configuring the inverter. It also provides information about troubleshooting the unit. It does not provide details about particular brands of batteries. You need to consult individual battery manufacturers for this information.

Audience

The guide is intended for users and operators of the Freedom X 1200 -120V Sine Wave Inverter. The Installation section starting on page 24 is intended for qualified personnel.

Qualified personnel have training, knowledge, and experience in:

- · Installing electrical equipment.
- · Applying all applicable installation codes.
- Analyzing and reducing the hazards involved in performing electrical work.
- Selecting and using Personal Protective Equipment (PPE).

Abbreviations and Acronyms

Α	Amperes
Ah	Amp-hours (a unit of battery capacity)
AC	Alternating Current [~]
ACC	Accessory in vehicle ignition system
AGM	Absorbed Glass Mat (a battery type)
BTS	Battery Temperature Sensor
DC	Direct Current [===]
GFCI	Ground Fault Circuit Interrupter
Hz	Hertz (a unit of frequency)
in-lb	inch-pound force (a unit of torque)
kW	Kilowatts (1000 watts)
LBCO	Low Battery Cutout (or Cutoff)
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LFP	LiFePO ₄ (lithium iron phosphate – a battery type)
N-m	Newton-meters (a unit of torque)
PN	Product Number
PPE	Personal Protective Equipment
s	Seconds (a unit of time)
SPD	Surge Protective Device
TVSS	Transient Voltage Surge Suppressor
V, VAC, VDC	Voltage, Volts AC, Volts DC
W	Wattage, watt (a unit of power)

Related Information

You can find more information about Xantrex products and services at https://xantrex.com/.



IMPORTANT SAFETY INSTRUCTIONS

READ AND SAVE THIS OWNER'S GUIDE FOR FUTURE REFERENCE.

This guide contains important safety instructions for the Freedom X 1200 -120V Sine Wave Inverter that must be followed during installing, operating, configuring, maintaining, and troubleshooting.

Read these instructions carefully and look at the equipment to become familiar with the device before installing, operating, configuring, maintaining, and troubleshooting it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

A DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.



WARNING indicates a hazardous situation which, if not avoided, **could result** in death or serious injury.

A CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

IMPORTANT: These notes describe things which are important for you to know, however, they are not as serious as a caution or warning.

Please Note: No responsibility is assumed by Xantrex for any consequences arising out of the use of this material.

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Product Safety Information

- Before using the inverter, read all instructions and cautionary markings on the unit, the batteries, and all appropriate sections of this guide.
- 2. Use of accessories not recommended or sold by the manufacturer may result in a risk of fire, electric shock, or injury to persons.
- The inverter is designed to be connected to both DC and AC electrical systems. The manufacturer recommends that all wiring be done by a certified technician or electrician to ensure adherence to the local and national electrical codes applicable in your jurisdiction.
- To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the inverter with damaged or substandard wiring.
- 5. Do not operate the inverter if it has been damaged in any way.
- 6. This unit does not have any user-serviceable parts. Do not disassemble the inverter except where noted for connecting wiring and cabling. See your warranty for instructions on obtaining service. Attempting to service the unit yourself may result in a risk of electrical shock or fire. Internal capacitors remain charged after all power is disconnected.
- To reduce the risk of electrical shock, disconnect both AC and DC power to or from the inverter before attempting any maintenance or cleaning or working on any components connected to the inverter. Do not disconnect under load.

- Turning the inverter to Standby using the Power button on the front panel will not reduce an electrical shock hazard.
- 8. The inverter must be provided with an equipment-grounding conductor connected to the AC input ground.
- Do not expose this unit to rain, snow, or liquids of any type.
 This product is designed for dry-locations-use only. Damp environments will significantly shorten the life of this product and corrosion caused by dampness will not be covered by the product warranty.
- To reduce the chance of short-circuits, always use insulated tools when installing or working with this equipment.
- 11. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with electrical equipment.
- This unit is an inverter only and is not intended for charging batteries.
- For marine applications, this unit must be installed with a drip shield. Refer to *Marine Installation on page 59* for details.

Freedom X 1200 Owner's Guide

▲DANGER

ELECTRICAL SHOCK AND FIRE HAZARD

Installation must be done by qualified personnel to ensure compliance with all applicable installation and electrical codes and regulations. Instructions for installing the Freedom X 1200 -120V Sine Wave Inverter are provided here for use by qualified personnel only.

Failure to follow these instructions will result in death or serious injury.

ADANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, BURN, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never operate energized with the wiring compartment cover removed.
- Energized from multiple sources. Before removing the wiring compartment cover - identify all sources, de-energize, and wait 2 min for circuits to discharge.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

AWARNING

FIRE AND EXPLOSION HAZARD

- Unit's components may produce arcs or sparks.
- Do not install near batteries, in machinery space, or in an area in which ignition-protected equipment is required.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Areas include any space containing gasoline-powered machinery, fuel tanks, as well as joints, fittings, or other connections between components of the fuel system.

AWARNING

ELECTRICAL SHOCK HAZARD

- Replace the wiring compartment cover before turning on power to this equipment.
- Use a torque screwdriver to tighten the captive nut panel screw to 5 in-lb (0.56 N-m) torque to ensure a proper ground connection. A tool is required to access the wiring compartment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

ACAUTION

ELECTRICAL SHOCK AND FIRE HAZARD

- Do not open. No serviceable parts inside. Provided with integral protection against overloads. Bonding between conduit connections is not automatic and must be provided as part of the installation.
- Read guide before installing or using.
- Do not cover or obstruct ventilation openings.
- Do not mount in zero-clearance compartment overheating may result.
- Do not expose to rain or spray. This inverter is designed for marine applications only when additional drip protection is installed in certain orientations. See "Approved Mounting Orientations" on page 34 for more information.
- Install GFCIs only as specified in this guide. Other types may fail to operate.
- Do not connect AC OUT to any source of power. Damage to unit may occur.
- For AC IN and AC OUT, use wires suitable for at least 75°C.

Failure to follow these instructions can result in injury or equipment damage.

Q

NOTES:

- Follow these instructions and those published by the battery manufacturer and the manufacturer of any equipment you intend to use in the vicinity of the battery. Review cautionary markings on these products and on the engine.
- Freedom X 1200 -120V Sine Wave Inverter products are designed for deep cycle lead-acid batteries. See warning below when connecting to lithium ion batteries.
- Do not use transformerless battery chargers in conjunction with the inverter due to overheating.

ACAUTION

LITHIUM ION BATTERY TYPE HAZARD

Make sure to use a lithium ion battery pack that includes a certified Battery Management System (BMS) with built-in safety protocols. Follow the instructions published by the battery manufacturer.

Failure to follow these instructions can result in serious injury or equipment damage.

ACAUTION

PHYSICAL INJURY HAZARD

This Freedom X 1200 -120V Sine Wave Inverter is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

Failure to follow these instructions can result in injury or equipment damage.

Precautions When Working With Batteries

IMPORTANT: Battery work and maintenance must be done by qualified personnel knowledgeable about batteries to ensure compliance with battery handling and maintenance safety precautions.

AWARNING

BURN FROM HIGH SHORT-CIRCUIT CURRENT, FIRE AND EXPLOSION FROM VENTED GASES HAZARDS

- Always wear proper, non-absorbent gloves, complete eye protection, and clothing protection. Avoid touching your eyes and wiping your forehead while working near batteries. See note #4 below.
- Remove all personal metal items, like rings, bracelets, and watches when working with batteries. See notes #5 and #6 below.
- Never smoke or allow a spark or flame near the engine or batteries.
- Never charge a frozen battery.
- Never charge a Lithium lon type battery with an ambient of 0 °C (-32 °F) or colder.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTES:

- Mount and place the Freedom X 1200 -120V Sine Wave Inverter unit away from batteries in a well ventilated compartment.
- Always have someone within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
- 3. Always have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
- 4. Keep battery terminals clean from corrosion. If battery acid or corrosion deposit contacts skin or clothing, wash immediately with soap and water. If battery acid or corrosion deposit enters your eye, immediately flood it with running cold water for at least twenty minutes and have someone within range of your voice or close enough to get medical attention immediately.
- Use extra caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion. Use tools with insulated handles only.
- Batteries can produce a short circuit current high enough to weld a ring or metal bracelet or the like to the battery terminal, causing a severe burn.
- 7. When removing a battery, always remove the negative terminal from the battery first for systems with grounded negative. If it is grounded positive, remove the positive terminal first. Make sure all loads connected to the battery and all accessories are off so you don't cause an arc.

Precautions When Placing the Unit

AWARNING

FIRE HAZARD

- Do not install the Freedom X 1200 or any part of its supplied wiring in engine compartments.
- For marine installation, always locate the Freedom X 1200 away from the battery and mounted separately in a wellventilated compartment with adequate space.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

ACAUTION

BURN HAZARD

Avoid touching the external surfaces - heatsink may be hot.

Failure to follow these instructions can result in injury or equipment damage.

NOTICE

RISK OF INVERTER DAMAGE

- Never allow battery acid to drip on the Freedom X 1200 when reading specific gravity, or filling battery.
- Never place the Freedom X 1200 unit directly above batteries; gases from a battery will corrode and damage the unit.
- Do not place a battery on top of the Freedom X 1200.

Failure to follow these instructions can result in equipment damage.

Regulatory

The Freedom X 1200 inverter is certified to appropriate US and Canadian standards. For more information see *Regulatory* approvals on page 94.

The Freedom X 1200 inverter is intended to be used for Recreational, Commercial and Fleet Vehicle, or Marine installations. This inverter is designed for marine applications only when additional drip protection is installed in certain orientations. See the section on Marine Installation for information.

EMI Information to the User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC / ISED CAN ICES-003 Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

ACAUTION

Unauthorized changes or modifications to the equipment could void the user's authority to operate the equipment.

End of Life Disposal

The Freedom X 1200 -120V Sine Wave Inverter is designed with environmental awareness and sustainability in mind. At the end of its useful life, the Freedom X 1200 can be decommissioned and disassembled. Components which can be recycled must be recycled and those that cannot be recycled must be disposed of according to local, regional, or national environmental regulations.

Many of the electrical components used in the Freedom X 1200 are made of recyclable material like steel, copper, aluminum, and other alloys. These materials can be auctioned off to traditional scrap metal recycling companies who resell reusable scraps.

Electronic equipment such as the circuit boards, connectors, and fuses can be broken down and recycled by specialized recycling companies whose goal is to avoid having these components end up in the landfill.

For more information on disposal, contact Xantrex.

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1 INTRODUCTION

The Freedom X 1200 -120V Sine Wave Inverter is designed with integrated inverting functions and power management features suitable for Recreational, Commercial and Fleet Vehicle, or Marine installations.

Please read this section to familiarize yourself with the main performance and protection features of the Freedom X 1200. This section includes:

Materials List	 16
Key Features	 16

Materials List

The Freedom X 1200 base package includes the following items:

- one Freedom X 1200 unit
- one Product Notice and extra safety labels
- one pre-installed DC ground enclosure lug
- one set of pre-installed M8 DC terminal nuts (not shown)

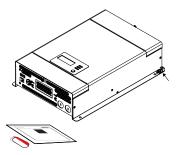


Figure 1 What's In The Box

NOTE: If any of the items are missing, contact Xantrex or any authorized Xantrex dealer for replacement. See *Contact Information on page 2*.

Key Features

Power for Most Appliances

The Freedom X 1200 inverter provides up to 1200 watts of continuous utility grade, sine wave power derived from a battery bank. It is designed to handle loads such as microwave ovens, TVs, DVD/Blu-ray players, and power tools. In addition, the Freedom X 1200's high-surge capability lets you handle many hard-to-start loads, including full size residential refrigerators.

The built-in transfer switch automatically transfers between inverter power and shore power from recreational facilities such as boat docks or campsites to ensure power is always available.

Back-up Capability

If incoming shore power is interrupted by external events like brownouts, the Freedom X 1200 automatically becomes an independent power source¹ that supplies utility grade AC power to your loads.

Assuming the inverter is connected to a battery source with an adequate charge at the time of the power interruption.

Comprehensive **Protection**

The Freedom X 1200's built-in protection features safeguard your batteries (from unnecessary drain) such as the low battery voltage alarm and shutdown and protect equipment such as a configurable AC transfer speed.

- Selectable Low Battery Shutdown: The low battery shutdown for the inverter can be manually selected by the user from 10.5 to 12.1 VDC.
- Voltage Shutdown Delay Timer: Configurable from 1 to 300 s to reduce an unnecessary shutdown of inverter operation such as during cranking or other brief but heavy discharge of battery.

- Inverter Power Save: The Freedom X 1200 can be programmed to automatically turn off after 1 to 25 h of continued operation of loads that are under 50 W. It is designed, with LBCO (low battery cut off), to prevent the battery from deep discharge.
- Low Power Consumption: When the inverter is power saving and the Freedom X 1200 is inverting without a load, it draws less than 0.6 amp of current from the battery (or battery bank). This feature allows the unit to operate without draining too much stored energy.

Transfer Speed

Configurable AC The Freedom X 1200 allows two speed settings for the AC transfer from AC Mode to Battery Mode and vice versa which avoids nuisance resetting of appliances. The normal transfer rate is for common appliances and the faster transfer rate is designed for more sensitive digital equipment like a desktop computer.

Overload Alarm and Shutdown

During Battery Mode (also called Inverter Mode), the Freedom X 1200 automatically alerts you if the loads that are connected and drawing power from the unit are close to approaching the maximum operating limit. If so, the Freedom X 1200 automatically shuts down when the maximum operating limit is exceeded. See Troubleshooting Reference on page 85 for precautions.

Alarm and Shutdown

Over temperature During Battery Mode, the Freedom X 1200 automatically alerts you if it is overheating and approaching the over-temperature shutdown limit. The Freedom X 1200 automatically shuts down when the limit is exceeded. See Troubleshooting Reference on page 85 for precautions.

Ignition Control

The Freedom X 1200 provides two userselectable options for ignition control:

- Ignition Auto-on: The Freedom X 1200 can automatically turn the inverter on and off in tandem with the vehicle's ignition circuit or a manually operated remote switch.
- Ignition Lockout: The Freedom X 1200 features the ability to inhibit the inverter from operating in the absence of a voltage signal from a vehicle's ignition circuit. This is particularly useful if the inverter is required to operate only when a vehicle's engine is running.

AC Output Frequency

The Freedom X 1200 is factory set to 60 Hz AC output frequency. It can be configured to 50 Hz for use in regions outside the USA and Canada that operate on 110-125 VAC/50 Hz.



2 FEATURES

This section identifies the default settings and the hardware features of the Freedom X 1200 -120V Sine Wave Inverter. This section includes:

AC/DC and GFCI Panel	20
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Side Panel	. 23

AC/DC and GFCI Panel

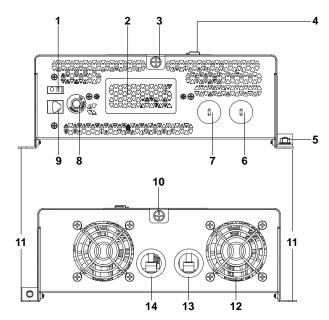


Figure 2 AC/DC and GFCI Panel

AWARNING

ELECTRICAL SHOCK HAZARD

Use a torque screwdriver to tighten the captive nut panel screw to 5 in-lb (0.56 N-m) torque of force to ensure a proper ground connection. A tool is required to access the wiring compartment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Table 1 AC/DC and GFCI Panel Features

Item	Description
1	ACC input terminal for connecting ignition control wiring.
2	The GFCI cover is removed when installing the customer-supplied GFCI receptacle (not included) is installed.
3	Captive nut panel screw holds the wiring compartment cover in place. See WARNING above.
4	Display panel. See succeeding pages for a description.
5	DC Grounding lug provides a ground path for the Freedom X 1200 chassis to the DC system ground. See WARNING <i>on page 21</i> .
6	AC input terminal opening for routing AC input wiring.
7	AC output terminal opening for routing AC output wiring.

20

Item	Description
8	15 A supplementary protector with reset button provides overload protection for the customer-supplied GFCI. Press to recover from an overload condition. In a hard wired installation, the supplementary protector does not protect output wiring.
9	Remote port (RJ12) allows you to connect an accessory remote control device.
10	Captive nut panel screw holds the wiring compartment cover in place. See WARNING on page 20.
11	Mounting flanges on both sides allow you to mount the inverter permanently on the interior deck or on a wall.
12	Ventilation grille (openings) must not be obstructed for the proper operation of the cooling fan and inverter. When the inverter is mounted, the ventilation grille must not point up or down.
	Cooling fans turn on when the internal temperature reaches a set point temperature.
13	DC terminal opening for routing (–) negative DC cable.
14	DC terminal opening for routing (+) positive DC cable.

AWARNING

ELECTRICAL SHOCK HAZARD

- Use a torque screwdriver to tighten the bolt on the DC ground lug to a torque of 23 in-lb (2.6 N-m) of force.
- Apply an anti-corrosion compound to the copper wire prior to connecting to the DC ground lug.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Display Panel

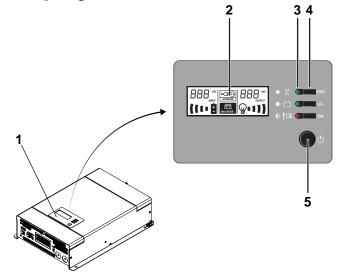


Figure 3 Display Panel

Table 2 Display Panel Features

Item	Description
1	Display panel displays status information on the screen. It is comprised of a display screen, LEDs, and buttons.
2	Multi-function LCD screen shows status information and error codes.
3	Status LEDs indicate the mode of operation.
4	Three function buttons change status information displayed on the screen. Also, changes inverter settings. See <i>Freedom X 1200 Display Panel on page 62</i> for detailed information on the panel's buttons.
5	Power [Standby] button is pressed for turning on the unit. The inverter turns on for the loads automatically.

Side Panel

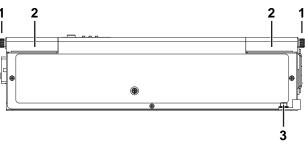


Figure 4 Side Panel

AWARNING

ELECTRICAL SHOCK HAZARD

- For item 1: Use a torque screwdriver to tighten the captive nut panel screw to 5 in-lb (0.56 N-m) torque to ensure a proper ground connection and a required tool access to the wiring compartment.
- For item 3: Use a torque screwdriver to tighten the bolt on the DC ground lug to a torque of 23 in-lb (2.6 N-m) of force.
- For item 3: Apply an anti-corrosion compound to the copper wire prior to connecting to the DC ground lug.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Table 3 Side Panel Features

Item	Description
1	Captive nut panel screw holds the wiring compartment cover in place. See WARNING on the left.
2	Wiring compartment cover protects the wiring compartment from debris and keeps the cables secure. Using the captive nut panel screw, the cover can be opened and lifted out during wiring. See WARNING on the left.
3	DC Grounding lug provides a ground path for the Freedom X 1200 chassis to the DC system ground. See WARNING on the left.

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3 INSTALLATION

This section provides sample installation information as a guide for your installation. For your convenience, the overall procedure is divided into these main steps:

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Before You Begin the Installation

Before beginning your installation:

- Read this entire Installation guide so you can plan the installation from beginning to end.
- Assemble all the tools and materials you require for the installation.
- Review the Important Safety Instructions on page 5.
- Be aware of all safety and electrical codes which must be met.

AWARNING

ELECTRICAL SHOCK AND FIRE HAZARD

- All wiring shall be done by qualified personnel to ensure compliance with all applicable installation codes and regulations.
- Do not connect to AC and DC power sources during installation. Disconnect from all power sources when servicing.
- Disable and secure all AC and DC disconnect devices and automatic generator starting devices.

Failure to follow these instructions can result in death, serious injury, or equipment damage

Installation Codes

Governing installation codes vary depending on the specific location and application of the installation. Some examples include the following:

- The U.S. National Electrical Code (NEC)
- The Canadian Electrical Code (CEC)
- The U.S. Code of Federal Regulations (CFRs)
- Canadian Standards Association/CSA Group (CSA) and the RV Industry Association (RVIA) standards and codes for installations in RVs
- The American Boat and Yacht Council (ABYC) standards and US Coast Guard Regulations (33CFR183, Sub Part I) for Marine installations in the U.S.

NOTE: It is the installer's responsibility to ensure that all applicable installation requirements are met.

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Basic Installation Procedures

This section provides sample installation information as a guide for your installation. For your convenience, the overall procedure is divided into these main steps:

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Step 5: Connecting AC Output to an Existing AC Circuit	40
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Step 7: Connecting to Port(s) on the Freedom X 1200	. 55
Step 8: Testing Your Installation	. 57

NOTE: For marine applications, see additional installation instructions *on page 59*.

Installation Tools and Materials

You will need the following to install the Freedom X 1200:

- Wire stripper
- Mounting (#2) screws or bolts
- #2 Phillips torque screwdriver
- 3mm slot long neck screwdriver for spring clamp AC terminals
- Torque wrench for DC terminals (½" or 13mm socket wrench)
- AC cable (that is, two-conductor-plus-ground cable), sized appropriately for load and application
- ½" trade-size strain relief clamps (for the AC cable clamp holes)
- Wire nuts or crimp connectors for AC wire and appropriate tools
- DC cable, sized appropriately for load and application
- Lugs for DC cables to fit ⁵/₁₆" DC stud terminals as well as appropriate tools (like a crimping tool)
- AC and DC disconnects and over-current protective devices

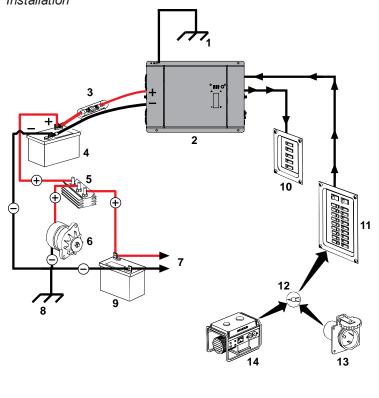
Step 1: Designing the Installation

Most Freedom X 1200 installations share common components, and some of these are briefly described in *Step 1: Designing the Installation*.

Figure 5 shows some components and their relationship to each other in a typical recreational vehicle or fleet vehicle installation. Also, see *Marine Installation on page 59*.

1	DC Equipment ground
2	Freedom X 1200
3	DC fuse/disconnect/DC circuit breaker
4	12V deep cycle battery [house]
5	Battery isolator
6	Alternator
7	To engine
8	DC Equipment ground
9	Starting battery
10	AC load panel
11	AC source panel
12	Selector switch
13	Shore power
14	Generator

Figure 5 Typical Recreational Vehicle and Fleet Vehicle Installation



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AC Shore Power

A source of 120 volts AC 60Hz sine wave alternating current provides energy to pass power through to AC loads. This source is usually the utility grid (power company) or an AC generator. An automatic or manual AC source selector switch can be used to switch between the multiple sources of shore power to the Freedom X 1200 system.

The AC source feeding the Freedom X 1200 must have the neutral conductor bonded to ground. When the inverter passes shore power through, it will lift its internal bonding relay on the output and will rely on the input neutral being bonded in order to ensure that the power delivered to a sub panel is properly bonded. See AC Output Neutral Bonding on page 30 for more information on bonding relay operation.

NOTE: Throughout this guide, the term "shore power" refers to AC input power from a utility grid, generator, or other AC source.

AC Disconnect and Over-Current Protection Device

Most safety requirements and electrical codes require the Freedom X 1200's AC and DC inputs and outputs to be provided with over-current protection (such as branch-rated circuit breakers or fuses) and disconnect devices. Ensure that your breakers and fuses have suitable temperature ratings for your wiring. Other codes and regulations may also be applicable to your installation.

AC Input

The branch-rated circuit breaker or fuse (connected through hard wiring) that is used to supply the Freedom X 1200 must be rated at no more than 30A and must be approved for use on 120 volts AC branch circuits. The wire used between the breaker and the Freedom X 1200 input must be sized adequately to carry current up to the rating of the input breaker and in accordance with the electrical codes or regulations applicable to your installation.

AC Output

The branch-rated circuit breaker or fuse must be rated at no more than the rating of the input breaker in the installation and must be approved for use on 120 volts AC branch circuits.

Devices

Disconnect Each system requires a method of disconnecting the AC circuits. If the over-current protection devices are circuit breakers, they will also serve as the disconnects. If fuses are used, separate AC disconnect switches will be needed ahead of the fuses. These will have to be a branch circuit rated for 120 volts AC and have an appropriate current rating.

AC Distribution Panels

Most systems incorporate distribution centers both ahead of the Freedom X 1200 (the AC source panel) and between the Freedom X 1200 and the loads (the AC load panel). An AC source panel includes a main circuit breaker, which serves as over-current protection and as a disconnect for the AC shore power supply line. Additional circuit breakers serve individual circuits, one of which serves the Freedom X 1200. The AC load panel can incorporate an AC output circuit breaker and breakers for individual load circuits.

NOTICE

RISK OF INVERTER DAMAGE

Do not connect the Freedom X 1200 to a 120/240V, 3-pole, 4-wire circuit.

Failure to follow these instructions can result in equipment damage.

AC Cabling

AC cabling includes all the wires and connectors between the AC source and the Freedom X 1200, as well as all AC wires and connectors between the Freedom X 1200 and the AC output panels, circuit breakers, and loads. The type and size of the wiring varies with the installation and load. For example, in high vibration environments, such as marine or RV applications, wire nuts may not be acceptable, so crimp splices would be required. In other applications, flexible multiple-strand wire may be required. Installation codes usually specify solid or stranded, overall size of the conductors, and type and temperature rating of the insulation around the wire. Cord must be of type S, SE, SEOO, SO, ST, STO, SJ, SJE, SJEOO, SJT or SJTO.

AC breakers and fuses must be sized to adequately protect the wiring that is installed on the input and output AC circuits of the Freedom X 1200. All breakers and wiring must be sized and connected in accordance with the electrical codes or regulations applicable to your installation. *Table 4* gives some examples of wiring sizes based on the U.S. National Electrical Code and the Canadian Electrical Code. These examples are based on using a two-conductor-plus-ground copper cable rated at 60 °C, and assuming an ambient temperature of up to 30 °C.

Table 4 Required AC Wire Size vs Breaker Rating

Breaker Size (A)	10A	15A	20A	30A
Minimum Wire Size (AWG)	14AWG	14AWG	12AWG	10AWG

AC Output Neutral Bonding

The neutral conductor of the Freedom X 1200's AC output circuit (that is, AC Output Neutral) is automatically connected to the safety ground during inverter operation. When AC utility power is present this connection is not present, so that the utility neutral (that is, AC Input Neutral) is only connected to utility ground at your source. This conforms to the National Electrical Code (NEC), which requires that separately derived AC sources (such as inverters and generators) have their neutral conductors tied to ground in the same way that the neutral conductor from the utility is tied to ground in only one place. Check the regulations for your specific application to ensure that the installation will comply with the necessary requirements. In other words, the AC Input Neutral ground bonding and Output Neutral ground bonding must be isolated from each other

AC Grounding

As per UL458 SA29.5, for all permanently connected marine inverters: The Freedom X 1200 should be connected to a grounded, metal, permanent wiring system. Also, make sure that an AC ground wire is connected to the AC ground terminal on the unit. Do not just connect the line and neutral wires.

All connections to the unit should comply with NFPA 1192 and all local codes and ordinances.

Ground Fault Circuit Interrupters (GFCIs)

A GFCI is a device that de-energizes a circuit when a current to ground exceeds a specified value that is less than that required to blow the circuit breaker. GFCIs are intended to protect people from electric shocks and are usually required in wet or damp locations.

Installations in marine and recreational vehicles require GFCI protection of branch circuits connected to the AC output of the Freedom X 1200.

The following GFCI receptacle will work correctly with the Freedom X 1200 in the inverter's AC output distribution wiring system.

Table 5 GFCI

Make	Model
Eaton/Cooper	SGF15W
Zatori/Cooper Con Town	

DC Cabling

This includes all the cables and connectors between the batteries, the DC disconnect and over-current protection device, and the Freedom X 1200. Most mobile installations require multi-strand insulated copper cables for flexibility and durability in high vibration environments and require disconnects and over-current devices. Electrical wiring sizes in North America are indicated by AWG notation. In other parts of the world, the metric system is used. Under the AWG standard, a larger gauge number indicates a smaller wire diameter. Wire size is usually marked on the larger sized cables. *Table 6* specifies the minimum recommended DC cable size and maximum fuse size for the Freedom X 1200. **The DC cables must be stranded, copper, and must be rated 90 °C minimum.** The cables should be terminated with lugs that fit the DC stud terminals snugly (5 /16" hole size) and properly torqued according to manufacturer-specified torque setting.

Table 6 Required Cable Sizes

Inverter	Cable Length:	Minimum	Maximum
	Battery to Inverter	Cable	battery
	(one way)	Size	Fuse Size
Freedom X 1200	Less than 5 feet (1.5 meters)	No. 2 AWG	150 A DC

NOTE:It is not recommended using a cable longer than 5 feet (1.5 meters) in each direction. North American cable sizes above are based on the US National Electrical Code Table 310.15(B) (17), 90 °C cables, assuming an ambient temperature of 30 °C cables.

IMPORTANT: Using the correct cable size is critical to achieving the rated performance of the Freedom X 1200 unit. When starting a heavy load the Freedom X 1200 can draw current surges from the battery of up to 400A. If the DC wiring is too small the voltage drop from this surge will result in a voltage at the Freedom X 1200 terminals that is too low for the Freedom X 1200 to operate correctly. The Freedom X 1200 may appear to operate correctly with smaller cables until a heavy load such as a microwave or refrigerator attempts to start - then the unit may work correctly sometimes and not work correctly other times.

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DC Disconnects and Over-Current Devices

The DC circuit from the battery to the Freedom X 1200 must be equipped with a disconnect and over-current device. This usually consists of a circuit breaker, a "fused-disconnect", or a separate fuse and DC disconnect. **Do not confuse AC circuit breakers with DC circuit breakers.** They are not interchangeable. The rating of the fuse or breaker must be matched to the size of cables used in accordance with the applicable installation codes. The breaker or disconnect and fuse should be located as close as possible to the battery, in the positive cable. Applicable codes may limit how far the protection can be from the battery. Battery terminal covers are recommended to protect terminals from moisture, dirt, and chemicals, which can cause corrosion and degradation.

Batteries

The Freedom X 1200 uses 12-volt battery banks. Every Freedom X 1200 system is recommended to have a deep-cycle battery (house) or group of batteries with a total capacity of 100 Ah or more which provides the DC current that the Freedom X 1200 converts to AC.

Step 2: Choosing a Location for the Unit

AWARNING

FIRE AND EXPLOSION HAZARDS

- Do not install the Freedom X 1200 in compartments containing batteries or flammable materials, or in locations that require ignition-protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, or joints, fittings, or other connections between components of the fuel system. This equipment contains components that tend to produce arcs or sparks.
- · Do not install on or over combustible surfaces.
- Do not cover or obstruct the ventilation openings.
- Do not install the Freedom X 1200 in a zero-clearance compartment. Overheating may result.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The Freedom X 1200 should only be installed in locations that meet the following requirements:

■ Dry. Do not allow water or other fluids to drip or splash on the Freedom X 1200. Do not mount the Freedom X 1200 in an area subject to splashing water or bilge water.

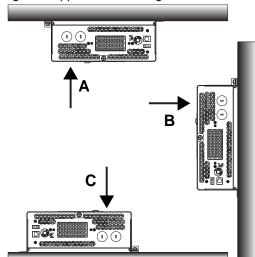
- **Cool.** Normal air temperature should be between -20 °C and 40 °C (-4 °F and 104 °F)—the cooler the better, for increased efficiency and product life extension.
- Ventilated. Allow at least 5 inches of clearance at the fan end of the Freedom X 1200 for air flow, 1 inch on each side, and 2 inches at the wiring access (AC and DC) end. The more clearance for ventilation around the unit, the better the performance. Do not allow the ventilation openings on the ends of the unit to become obstructed.
- Safe. Do not install the Freedom X 1200 in the same compartment as batteries or in any compartment capable of storing flammable liquids like gasoline.
- Close to the battery compartment and the AC source and load panels. Avoid excessive cable lengths (which reduce input and output power due to wire resistance). Use the recommended cable lengths and sizes, especially between the battery banks and the Freedom X 1200.
- Protected from battery acid and gases. Never allow battery acid to drip on the Freedom X 1200 or its wiring when reading specific gravity or filling the battery. Also do not mount the unit where it will be exposed to gases produced by the batteries. These gases are very corrosive, and prolonged exposure will damage the Freedom X 1200.

Step 3: Mounting the Unit

To mount the Freedom X 1200:

- Remove the Freedom X 1200 from its shipping container, verify that all components are present, and record relevant product information on *Information About Your System on* page 2.
- Select an appropriate mounting location and orientation (see Figure 6). To meet regulatory requirements, for use in onland applications, the Freedom X 1200 must be mounted in one of the following orientations:
 - a. Under a horizontal surface (see A)
 - In a horizontal position on a vertical surface (see B)
 NOTE: For marine installations, only this orientation is allowed, due to the probability of moisture finding access into the enclosure.
 - c. On a horizontal surface (see C)

Figure 6 Approved Mounting Orientations



- Mark the desired number of mounting holes on the wall by placing the unit on the wall.
- 4. Pilot-drill the mounting holes.
- 5. Fasten the Freedom X 1200 to the mounting surface. If you are mounting the unit on a wall or bulkhead, use #12 or #14 pan-head wood or sheet metal screws to secure it to the framing behind the wall or bulkhead. Alternatively, use nut inserts and 1/4"-20 machine screws.

Connecting the DC Equipment Ground

AWARNING

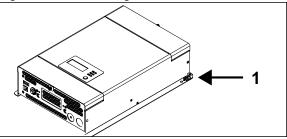
ELECTRIC SHOCK HAZARD

Never operate the Freedom X 1200 without properly connecting the DC equipment ground. A shock and energy hazard could result from improper grounding.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The Freedom X 1200 has a DC ground lug on the side of the unit as shown in *Connecting the DC Equipment Ground*. Follow the guidelines in *Connecting the DC Equipment Ground* to connect the inverter's chassis to the ground.

Figure 7 DC Grounding Connection



1 DC grounding lug

DC Grounding Locations

You must connect the equipment DC ground lug to a grounding point—usually the vehicle's chassis or DC negative bus ground—using recommended copper wire size (if insulated then green insulation with or without one or more yellow stripes) or larger.

Make sure to tighten the bolt on the DC ground lug to a torque of 23 in-lb (2.6 N-m) of force. Apply an anti-corrosion compound to the copper wire prior to connecting to the DC ground lug.

For recommended equipment ground cable size, see below.

Table 7 DC Equipment ground cable size

Application	Minimum equipment ground cable size (Stranded copper cable is required)	
Recreational Vehicle ^a	No. 8 AWG	
Marine ^b	No. 3 AWG	

NOTE: There are no restrictions on length for the equipment ground cable but try to make it as short as practical to a secure chassis connection.

^aBased on US National Electrical Code NFPA70, Article 551, par. 551-20c and ANSI/RVIA LV, § 2-5.1.

bBased on ABYC E-11 § 11.16 and A-31 § 31.6.5.

Step 4: Connecting the AC Input Wires

AWARNING

ELECTRIC SHOCK AND FIRE HAZARDS

Make sure wiring is disconnected from all electrical sources before handling. All wiring must be done in accordance with local and national electrical wiring codes. Do not connect the output terminals of the Freedom X 1200 to any incoming AC source.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

General AC Wiring Considerations

The AC input terminal is located inside the unit through the AC panel's ½" trade-size hole and is labeled properly as **AC IN** or **AC INPUT**. The unit comes with spring clamp-type terminals where individual wires can be attached securely.

NOTICE

EQUIPMENT DAMAGE

Make sure the wires are connected properly. The AC wiring terminal blocks are split into input and output sections.

Failure to follow these instructions can result in equipment damage.

AC Wiring Connectors

Where applicable, connect AC wires with crimp-on splice connectors. The amount of insulation you strip off individual wires will be specified by the connector manufacturer and is different for different types of connectors.

AC and DC Wiring Separation

Do not mix AC and DC wiring in the same conduit or panel. Where DC and AC wires must cross, make sure they do so at 90° to one another. Consult applicable codes for details about DC and AC wiring in close proximity to each other.

AC Wiring and GFCIs

You can plug loads of 12 amps continuous or 15 amps maximum directly into the customer-supplied GFCI receptacle on the front panel of the Freedom X 1200. If installed, you can also connect the inverter to an existing AC installation and then plug loads into GFCI receptacles connected to that circuit.

If you plan to use the Freedom X 1200 with a customer-supplied GFCI receptacle installed on the unit, proceed to *GFCI* Connections on page 43.

AC wiring includes all the wires and connectors between the AC source and the Freedom X 1200 and all wiring between the inverter, the AC panels, GFCI, and circuit breakers. The type and size of the wiring varies with the installation and load. For some RV applications, flexible multiple-strand copper wire is required.

AC wiring must be sized appropriately using conductors with insulation rated at least 75 °C to carry full load current on the input and output AC circuits in accordance with the electrical codes or regulations applicable to your installation. *Table 8* is based on the U.S. National Electrical Code and the Canadian Electrical Code, assuming two-conductor-plus-ground cable, using 75 °C wiring, at an ambient temperature of 30 °C. Other codes and regulations may be applicable to your installation.

Table 8 Required AC wire size vs. required breaker rating

	Required Breaker Size (A)	Required Wire Size (AWG)
Freedom X 1200	30 A maximum 15 A maximum through a GFCI	10 AWG

When making the AC input and AC output connections, observe the correct color code for the appropriate AC wire, as described in *Table* 9 below.

Table 9 Color codes for typical AC wiring

Color	AC Wire
Black/Red/Brown	Line
White/light blue	Neutral

Color	AC Wire
Green, green/yellow, or bare copper	Ground

NOTICE

REVERSE POLARITY DAMAGE

Make sure the wires are connected properly. Improper connections (connecting a line conductor to a neutral conductor, for example) will cause the Freedom X 1200 to malfunction and may permanently damage the inverter. Damage caused by a reverse polarity connection is not covered by your warranty.

Failure to follow these instructions can result in equipment damage.

Wiring Knockouts

When installing wires to the AC terminals, the AC input and output holes are provided to accommodate $\frac{1}{2}$ " trade-size strain relief clamps^a.

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^aCompatible strain-relief clamp with manufacturer part number: 3302-TB.

AC Input Connections

To make a permanent connection to existing AC wiring:

- 1. Ensure AC and DC power sources are turned off.
- 2. Install the required circuit breaker in the AC distribution panel supplying AC power to the unit.
- 3. Remove the wiring compartment cover by loosening the captive nut panel screw and lifting the cover up and out.

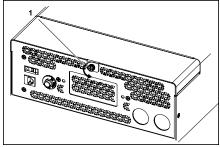
AWARNING

ELECTRIC SHOCK HAZARD

Use a screwdriver to loosen the captive nut panel screw.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

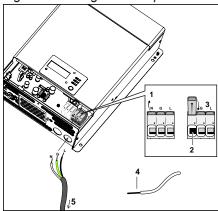
Figure 8 Loosening the captive nut panel screw



1 Captive nut panel screw

- 4. Strip a single AC input wire, as appropriate. Strip 15 mm off the ends of each of the three the wires (tin the exposed copper wire with lead-free solder using a soldering iron).
- 5. Remove the knockout and install a ½" strain relief clamp.
- 6. Route the wires through the strain relief clamp (not shown in the figure).

Figure 9 Routing the AC input wires



1	step 8a	4	15mm
2	step 8b	5	to circuit breaker
3	step 8c		NOTE: AC Input hole - install a strain relief clamp (not shown)

7. Locate the Neutral, Ground and Line terminals on the AC input terminal labeled as **N**, **G**, and **L** respectively.

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- 8. Connect each AC wire into its corresponding terminal on the no-tool cage clamp terminal block.
 - a. Lift the terminal lever (as shown in the previous figure).
 - b. Insert the wire fully into the open slot.
 - c. Lower the terminal lever to secure the wire in the slot.
- 9. Make sure that each AC wire is matched and connected to the Neutral (N), Ground (G), and Line (L) connections.
- 10. Tighten the strain relief clamp to secure the wires.
- Replace the wiring compartment cover onto the unit (using a #2 Phillips torque screwdriver - see WARNING), if you are not connecting other wires such as for the AC Output. Otherwise, keep the AC compartment open and proceed to the next step.

AWARNING

ELECTRICAL SHOCK HAZARD

Use a torque screwdriver to tighten the captive nut panel screw to 5 in-lb (0.56 N-m) torque of force to ensure a proper ground connection. A tool is required to access the wiring compartment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

12. Connect the other end of the wires to the circuit breaker in the AC distribution panel supplying AC power to the unit.

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Step 5: Connecting AC Output to an Existing AC Circuit

AWARNING

ELECTRIC SHOCK AND FIRE HAZARDS

- Make sure wiring is disconnected from all electrical sources before handling. All wiring must be done in accordance with local and national electrical wiring codes.
- A manufacturer-tested and approved GFCI must be connected to the Freedom X 1200 AC output, and GFCI protection must be provided on every branch circuit feeding a receptacle connected to the AC hard wired installation. Other types may fail to operate properly when connected to the Freedom X 1200. See Ground Fault Circuit Interrupters (GFCIs) on page 30.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE

EQUIPMENT DAMAGE

- Do not connect any AC source (such as a generator or utility power) to the AC output wiring of the Freedom X 1200.
- The Freedom X 1200 will not operate if its output is connected to AC voltage from a source, and potentially hazardous or damaging conditions may occur. These conditions can occur even if the Freedom X 1200 is off.

Failure to follow these instructions can result in equipment damage.

Do not connect the Freedom X 1200 to an AC branch circuit that has high-power consumption loads that exceed its output wattage rating.

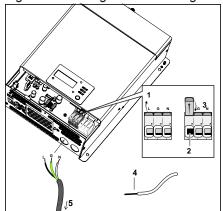
The Freedom X 1200 will not operate electric heaters, air conditioners, stoves, and other electrical appliances that consume more than its rated output wattage.

There are three kinds of AC Output Connections. These are:

- Connecting to an existing permanent AC output circuit. Follow the instructions on AC Output Connections on page 41 and finish the installation there in that section.
- Installing a GFCI receptacle only without connecting to an existing permanent AC output circuit. Follow the instructions on GFCI Connections on page 43 and finish the installation there in that section.
- Installing a GFCI receptacle and also connecting to an existing permanent AC output circuit. Follow the instructions on GFCI with AC Output Wiring Connections on page 46 and finish the installation there in that section.

AC Output Connections

Figure 10 Routing and connecting the AC output wires



1	step 7a	4	15mm
2	step 7b	5	to circuit breaker
3	step 7c		NOTE: AC Output hole - install a strain relief clamp (not shown)

To make a permanent connection to existing AC wiring:

- 1. Ensure AC and DC power sources are turned off, if not already done from AC Input Connections on page 38.
- 2. Install the required circuit breaker in the inverter distribution panel receiving AC power from the inverter.
- 3. Remove the wiring compartment cover, if not already done from AC Input Connections on page 38.

AWARNING

ELECTRIC SHOCK HAZARD

Use a screwdriver to loosen the captive nut panel screw.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- 4. Strip a single AC output wire, as appropriate. Strip 15 mm off the ends of each of the three the wires (tin the exposed copper wire with lead-free solder using a soldering iron).
- 5. Remove the knockout and install a ½" strain relief clamp.
- 6. Route the wires through the strain relief clamp (not shown in the figure).
- 7. Connect each AC wire into its corresponding terminal on the no-tool cage clamp terminal block.
 - a. Lift the terminal lever (as shown on the figure).
 - b. Insert the wire fully into the open slot.
 - c. Lower the terminal lever to secure the wire in the slot.
- 8. Make sure that each AC wire is matched and connected to the Line (**L**), Ground (**G**), and Neutral (**N**) connections.
- 9. Tighten the strain relief clamp to secure the cable jacket.
- Replace the wiring compartment cover (using a #2 Phillips torque screwdriver - see WARNING), if you are finished with connecting all the AC wires in the unit.

AWARNING

ELECTRICAL SHOCK HAZARD

Use a torque screwdriver to tighten the captive nut panel screw to 5 in-lb (0.56 N-m) torque of force to ensure a proper ground connection. A tool is required to access the wiring compartment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- Connect the other end of the wires to a circuit breaker in AC distribution panel providing AC power to the loads.
- 12. End of AC Output Connections.

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GFCI Connections

NOTICE

RISK OF EQUIPMENT DAMAGE

Use the 15 A supplementary protector for the GFCI receptacle only. The breaker is not intended for use in branch circuits.

Failure to follow these instructions can result in equipment damage.

To install a GFCI on the unit:

- 1. Ensure AC and DC power sources are turned off, if not already done from AC Input Connections on page 38.
- 2. Install the required circuit breaker in the inverter distribution panel receiving AC power from the inverter.
- 3. Remove the wiring compartment cover, if not already done from *AC Input Connections on page 38*.

AWARNING

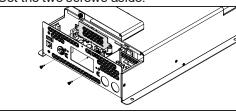
ELECTRIC SHOCK HAZARD

Use a screwdriver to loosen the captive nut panel screw.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- 4. Prepare the following:
 - one 5" (127mm) black AC wire (for Line connection)
 - one 5" (127mm) white AC wire (for Neutral connection)
 - one 5" (127mm) green AC wire (for Ground connection)
 - three spade ferrules
 - · three straight ferrules
 - one twist-on wire connector (marrette)
- 5. Remove the GFCI cover plate by removing the two screws holding it in place.

6. Set the two screws aside.



- 7. Unpack the customer-supplied GFCI receptacle and lay out the GFCI unit and the two mounting screws. See *Ground Fault Circuit Interrupters (GFCIs) on page 30* for information on compatibility.
- 8. Using the labeled diagram in *Figure 11 on page 45*, terminate the wires with straight or spade ferrules and connect the wires to the correct terminals.
- 9. Replace the wiring compartment cover (using a #2 Phillips torque screwdriver see WARNING), if you are finished with connecting all the AC wires in the unit.

AWARNING

ELECTRICAL SHOCK HAZARD

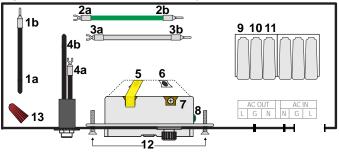
Use a torque screwdriver to tighten the captive nut panel screw to 5 in-lb (0.56 N-m) torque of force to ensure a proper ground connection. A tool is required to access the wiring compartment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

10. End of GFCI Connections.

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Figure 11 Parts inside the AC compartment



2	5" (127mm) green stranded wire. 2a (spade ferrule) and 2b (straight ferrule)
3	5" (127mm) white stranded wire. 3a (spade ferrule) and 3b (straight ferrule)
4	15 A supplementary protector with two wires 4a (bottom, spade ferrule) and 4b (top, stripped)
5	GFCI's LOAD terminals (top and bottom). The two terminals may or may not be covered by a yellow tape. ADO NOT REMOVE THE TAPE .
6	GFCI's LINE for Neutral. Silver terminal (bottom)
7	GFCI's LINE for Live. Brass terminal (top)
8	GFCI's Ground terminal (green)
9	Inverter AC OUT - (L)ine terminal

5" (127mm) black stranded wire. 1a (stripped) and 1b (straight ferrule)

Inverter AC OUT - (G)round terminal
Inverter AC OUT - (N)eutral terminal
GFCl's mounting screws. Use the two outer holes

Twist-on wire connector

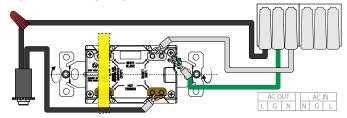
Match the wire connectors to the corresponding terminals:

- Connect each AC wire into its corresponding terminal on the no-tool cage clamp terminal block by lifting the terminal lever, insert the ferrule fully into the open slot, and lowering the terminal lever to secure the wire in the slot.
 - a. Connect 1b to 9.
 - b. Connect 2b to 10.
 - c. Connect 3b to 11.

Make sure that each AC wire is matched and connected to the Line (L), Ground (G), and Neutral (N) connections.

- Splice 1a and 4b using a twist-on wire connector as shown in Figure 11 item 13.
- 3. Connect 2a to 8.
- 4. Connect 3a to 6.
- 5. Connect 4a to 7.
- 6. Attach and secure the GFCI receptacle to the panel inside the wiring compartment using the two mounting screws as shown in *Figure 11* item 12.

Figure 12 Wiring diagram



GFCI with AC Output Wiring Connections

NOTICE

RISK OF EQUIPMENT DAMAGE

Use the 15 A supplementary protector for the GFCI receptacle only. The breaker is not intended for use in branch circuits.

Failure to follow these instructions can result in equipment damage.

To install a GFCI on the unit and connect to an AC Output Wiring circuit:

- Ensure AC and DC power sources are turned off, if not already done from AC Input Connections on page 38.
- 2. Install the required circuit breaker in the inverter distribution panel receiving AC power from the inverter.
- 3. Remove the wiring compartment cover, if not already done from *AC Input Connections on page 38*.

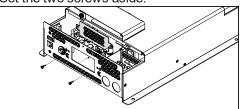
AWARNING

ELECTRIC SHOCK HAZARD

Use a screwdriver to loosen the captive nut panel screw.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- 4. Remove the knockout and install a ½" strain relief clamp.
- Remove the GFCI cover plate by removing the two screws holding it in place.
- 6. Set the two screws aside.



- 7. Unpack the customer-supplied GFCI receptacle and lay out the GFCI unit and the two mounting screws. See *Ground Fault Circuit Interrupters (GFCIs) on page 30* for information on compatibility.
- 8. Prepare the following:
 - 1 × 5" (127mm) black AC wire (for Line connection)
 - 2 × 5" (127mm) white AC wire (for Neutral connection)
 - 2 × 5" (127mm) green AC wire (for Ground connection)
 - 3 × spade ferrules
 - 3 × straight ferrules
 - 3 × twist-on wire connector (marrettes)
- 9. Using the labeled diagram in *Figure 13 on page 48*, strip, terminate the wires with straight or spade ferrules, and connect the wires to the correct terminals.
- Replace the wiring compartment cover (using a #2 Phillips torque screwdriver - see WARNING), if you are finished with connecting all the AC wires in the unit.

AWARNING

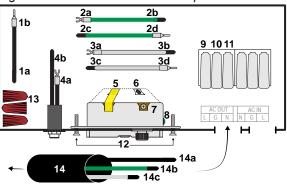
ELECTRICAL SHOCK HAZARD

Use a torque screwdriver to tighten the captive nut panel screw to 5 in-lb (0.56 N-m) torque of force to ensure a proper ground connection. A tool is required to access the wiring compartment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

11. End of GFCI with AC Output Wiring Connections.

Figure 13 Parts inside the AC compartment



1	5" (127mm) black stranded wire. 1a (stripped) and 1b (straight ferrule)
2	5" (127mm) green stranded wire. 2a (spade ferrule) and 2b (stripped) 5" (127mm) green stranded wire. 2c (stripped) and 2d (straight ferrule)
3	5" (127mm) white stranded wire. 3a (spade ferrule) and 3b (stripped) 5" (127mm) white stranded wire. 3c (stripped) and 3d (straight ferrule)
4	15 A supplementary protector with two wires 4a (bottom, spade ferrule) and 4b (top, stripped)
5	GFCI's LOAD terminals (top and bottom). The two terminals may or may not be covered by a yellow tape. ADO NOT REMOVE THE TAPE .
6	GFCI's LINE for Neutral. Silver terminal (bottom)
7	GFCI's LINE for Live. Brass terminal (top)
8	GFCI's Ground terminal (green)
9	Inverter AC OUT - (L)ine terminal
10	Inverter AC OUT - (G)round terminal
11	Inverter AC OUT - (N)eutral terminal
12	GFCI's mounting screws. Use the two outer holes.
13	Twist-on wire connectors
14	3-wire AC cable, stripped

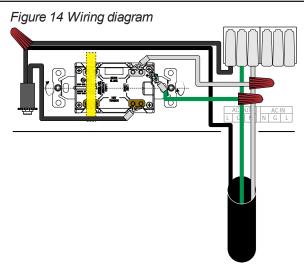
Match the wire connectors to the corresponding terminals:

- Connect each AC wire into its corresponding terminal on the no-tool cage clamp terminal block by lifting the terminal lever, insert the ferrule fully into the open slot, and lowering the terminal lever to secure the wire in the slot.
 - Connect 1b to 9.
 - b. Connect 2d to 10.
 - c. Connect 3d to 11.

Make sure that each AC wire is matched and connected to the Line (L), Ground (G), and Neutral (N) connections.

- 2. Route the AC cable as shown in *Figure 13* item 14 and strip each of the wires **14a**, **14b**, **14c** within the unit.
- 3. Splice the following using a twist-on wire connector as shown in *Figure 13*.
 - a. Splice 1a, 4b, and 14a.
 - b. Splice 2b, 2c, and 14b.
 - c. Splice 3b, 3c, and 14c.
- Connect 2a to 8.
- Connect 3a to 6.
- Connect 4a to 7.
- 7. Attach and secure the GFCI receptacle to the panel inside the wiring compartment using the two mounting screws as shown in *Figure 13* item 12.

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- 12. Tighten the strain relief clamp to secure the wires.
- 13. Replace the wiring compartment cover (using a #2 Phillips torque screwdriver see WARNING), if you are finished with connecting all the AC wires in the unit.

AWARNING

ELECTRICAL SHOCK HAZARD

Use a torque screwdriver to tighten the captive nut panel screw to 5 in-lb (0.56 N-m) torque of force to ensure a proper ground connection. A tool is required to access the wiring compartment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

 Connect the other end of the wires to a circuit breaker in AC distribution panel providing AC power to the loads as shown in Figure 13.

Step 6: Connecting the DC Cables

NOTICE

REVERSE POLARITY

- Check cable polarity at both the battery and the Freedom X 1200 before making the final DC connection. Positive must be connected to positive; negative must be connected to negative. Check to see if the reverse polarity LED (see Step 6: Connecting the DC Cables) is not illuminated.
- Reversing the positive and negative battery cables will blow a fuse in the Freedom X 1200 and void your warranty.

Failure to follow these instructions can result in equipment damage.

AWARNING

FIRE HAZARD

Use only stranded, copper wire rated minimum 90 °C (105 °C for marine installations). Make sure all DC connections are tight to a torque of 71–89 in-lb (8–10 Nm) of force. Loose connections will overheat.

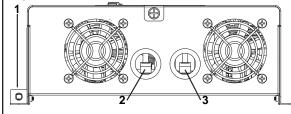
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Follow the procedure given below to connect the battery leads to the terminals on the DC end. The cables should be as short as possible and large enough to handle the required current, in accordance with the electrical codes or regulations applicable to your installation. *Table 6* specifies the minimum DC cable size and maximum fuse size for the Freedom X 1200.

If at all possible, minimize routing your DC cables through an electrical distribution panel, battery isolator, or other device that will cause additional voltage drops which can degrade the inverter's ability to operate the loads.

Figure 15 shows the DC end for your reference. Reversing the connections may void the warranty.

Figure 15 DC End



1	DC grounding lug
2	positive (+)
2	negative (–)

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To make the DC connections:

- 1. Make sure the inverter is off and no AC or DC is connected to the unit.
- 2. Remove the wiring compartment cover by loosening the captive nut panel screw.

AWARNING

ELECTRIC SHOCK HAZARD

Use a screwdriver to loosen the captive nut panel screw.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- Loosen the DC terminal nuts from the terminal bolts and set them aside for later.
- Strip ½" (13 mm) to ¾" (19 mm) insulation from one end of each cable. The amount stripped off will depend on the terminals chosen.
- 5. Attach the connectors that will secure the cables to the battery, to the disconnect/battery selector switch, and the fuse block. The connectors you use must create a permanent, low-resistance connection. It is recommended to use approved and certified cable ring lugs. Use the tool recommended by the terminal manufacturer. Make sure no stray wires protrude from the lug or terminal.

NOTE: You may find it more convenient to have the cable lugs attached by the company that sells you the cable and/or connectors.

- 6. Strip ½" (13 mm) to ¾" (19 mm) of insulation from each cable end that will be connected to the inverter. The amount stripped off will depend on the terminals chosen.
- Attach the cable ring lug that will join the cable to the inverter DC terminal. Cover the lug stem with heat shrink insulation (see Step 6: Connecting the DC Cables) to ensure that the lug does not touch the enclosure.
- 8. Install a fuse and fuse holder in the cable that will be used for the positive side of the DC circuit. The fuse must:
 - a. be as close to the battery positive terminal as possible
 - b. be rated for DC circuits
 - c. have an Ampere Interrupting Capacity (AIC) that exceeds the short-circuit current available from the battery (that is, Class T fuse)
- 9. To prevent sparking when making the connection, ensure the disconnect/battery selector switch is off.
- Route the positive cable through the left side strain relief clamp and attach the cable lug on the positive cable to the positive DC terminal on the inverter.
- 11. Fasten the DC terminal nut (set aside earlier) to the terminal bolt. Tighten the nut to a torque of 71–89 in-lb (8–10 N-m) of force. Do not overtighten. Make the connection snug enough so the cable lug does not move around on the DC terminal. Center it through the DC knockout hole and do not let it touch the edge. See Step 6: Connecting the DC Cables on page 50.

AWARNING

ELECTRICAL SHOCK HAZARD

- Tighten the nuts on the DC terminals properly. Loose connections cause excessive voltage drop and may cause overheated wires and melted insulation.
- Do not over-tighten the nut on the DC input terminals because damage to the DC input terminals may result. Use a torque screwdriver to tighten the nut to a maximum torque of 89 in-lb (10 N-m) of force.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

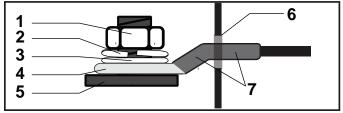
NOTICE

REVERSE POLARITY

- Check cable polarity at both the battery and the Freedom X 1200 before making the final DC connection. Positive must be connected to positive; negative must be connected to negative. Check to see if the reverse polarity LED (see Step 6: Connecting the DC Cables) is not illuminated.
- Reversing the positive and negative battery cables will blow a fuse in the Freedom X 1200 and void your warranty.

Failure to follow these instructions can result in equipment damage.

Figure 16 DC Cable Connections



1	DC terminal bolt nut	
2	lock washer	
3	flat washer	
4	cable ring lug	
5	DC terminal	
6	DC knockout hole	
7	DC cable with heat shrink insulation covering the lug stem	
NOTE: The DC cable lug stem must be fully insulated with the heat shrink.		

12. Before proceeding, double check that the cable you have just installed connects the positive DC terminal of the inverter to the disconnect/battery selector switch, fuse holder, and that the other end of the fuse holder is connected to the positive terminal of the battery.

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AWARNING

FIRE HAZARD

Do not complete the next step if flammable fumes are present. Explosion or fire may result if the disconnect/battery selector switch is not in the off position. Thoroughly ventilate the battery compartment before making this connection.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- 13. Route the negative cable through the right side strain relief clamp and connect the cable from the negative post of the battery to the negative DC terminal of the inverter.
- 14. Fasten the DC terminal nut (set aside earlier) to the terminal bolt. Tighten the nut to a torque of 71–89 in-lb (8–10 N-m) of force. Do not overtighten. Make the connection snug enough so the cable lug does not move around on the DC terminal. Center it through the DC knockout hole and do not let it touch the edge.

 Replace the wiring compartment cover by tightening the captive nut panel screw. See the following electrical shock hazard warning.

AWARNING

ELECTRICAL SHOCK HAZARD

Use a torque screwdriver to tighten the captive nut panel screw to 5 in-lb (0.56 N-m) torque of force to ensure a proper ground connection. A tool is required to access the wiring compartment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

DC Equipment Grounding

To connect the DC equipment ground:

- The DC equipment grounding lug (DC ground lug) on the DC end of the Freedom X 1200 is used to connect the chassis of the Freedom X 1200 to your system's DC negative connection or grounding bus point as required by electrical regulations.
- Use copper wire that is either bare or provided with green insulation. Do not use the DC ground lug for your AC grounding. See the AC wiring instructions in this section.
- Follow the guidelines below that correspond to the specific type of installation. These guidelines assume you are using the DC supply cable and fuse sizes recommended in this guide. If you are using different sizes, refer to the applicable installation code for DC grounding details.
- 4. See Figure 7 on page 35 for the location of the DC ground lug. Make sure to tighten the bolt on the DC ground lug to a torque of 23 in-lb (2.6 N-m) of force. Apply an anti-corrosion compound to the copper wire prior to connecting to the DC ground lug.

Recreational Vehicle

Use 8AWG minimum-sized, stranded copper wire and connect it between the Chassis Ground lug and the vehicle's DC grounding point (usually the vehicle chassis or a dedicated DC ground bus). See regulatory references below.

Marine

Use stranded copper wire that is bare or has insulation rated minimum 105 °C, and connect it between the Chassis Ground lug and the boat's DC grounding bus or engine negative bus. Use a wire of gauge 1/0AWG minimum. See regulatory references below.

Regulatory references

For DC voltage systems 60 VDC or less in an RV installation, an 8AWG copper bonding conductor would be acceptable for the inverter enclosure ground bonding only per UL458 §63.6; §30.10 standard [s 150 mV @ 30A connection, per §63.9; §63.10] and per ANSI/RVIA LV code §2-5.1 Bonding Voltage Converter Enclosures. The "house" battery system must, however, be ground bonded per ANSI/RVIA LV code §2-4 Auxiliary Battery Grounding; and For DC voltage systems 60 VDC or less in a marine installation, [UL458 §SA7.2] a DC Grounding conductor shall not be smaller than one size under that required for current carrying conductors supplying the device per ABYC E-11 §11.16.2 but not less than 8AWG [USGC 46 CFR §111.05-31].

Step 7: Connecting to Port(s) on the Freedom X 1200

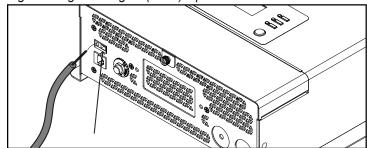
Connecting to ACC Signal

The Freedom X 1200 can be wired to inhibit inverter operation in the absence of a vehicle's (or vessel's) ignition control signal. This feature can avoid unnecessary battery drain that would otherwise occur if the inverter was operated without a charging source such as the vehicle alternator.

To enable ignition control:

- 1. Ensure that AC and DC power are both OFF.
- Ensure the vehicle's ignition is turned to OFF position. It is highly recommended to remove battery power by disconnecting the vehicle's battery cables. Refer to the vehicle's user manual for proper instructions on how to disconnect the battery cables.
- Locate the vehicle's ignition control wire from the vehicle's ignition circuit. This wire must be fused appropriately at no more than 5 A. Refer to the vehicle's user manual for guidance.
- 4. Locate the ACC input (ignition signal input) terminal on the left side of the connector. The rectangular slot on the right is used to release the spring clamp. See *Figure 17*

Figure 17 Ignition signal (ACC) input terminal



- 5. Using a 3mm slot long neck screwdriver, push into the rectangular slot to release the spring clamp.
- 6. Insert the ignition control wire into the round ACC input terminal slot.
- 7. Pull the screwdriver out to engage the spring clamp and secure the wire to the terminal.

NOTE: The mechanical elements of the ACC input terminal works in conjunction with the Ignition Control features set separately from the display panel.

Description of Ignition Control Features

For information about the features and instructions on changing the ignition control features, see *Operation on page 61*.

Table 10 Ignition Control Features

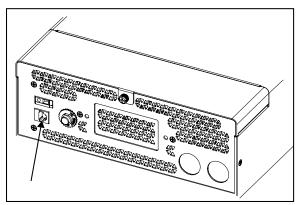
Ignition Auto- on (ЯЬО)	This setting allows the inverter to operate (Battery mode) automatically when an ignition control wire is connected to the ACC input and a valid ignition signal is constantly detected. The inverter works in tandem with the vehicle's ignition circuit.
Ignition Lock- out (LDE)	This setting allows the inverter to operate (Battery mode) when an ignition control wire is connected to the ACC input terminal and a valid ignition signal is constantly detected. When enabled, you have to manually press the Power button on the display panel to operate the inverter.
Off (DFF)	To completely disable the ignition control features do the following: Set Ignition Control to Off (DFF) using the Select buttons on the Display panel.

Connecting to the Remote Port

The Freedom X 1200 can accommodate the Freedom X Remote Panel (sold separately; comes with 25ft-cable).

To connect the remote panel to the remote port:

Plug the remote panel unit's cable connector to the RJ12 Remote port on the unit.



NOTE: When the remote panel is connected, turn the inverter's Power button to Standby (up position). This allows the remote panel to control the inverter's power status.

Step 8: Testing Your Installation

A WARNING

ELECTRIC SHOCK HAZARD

Pressing the Power button to turn the Freedom X 1200 inverter to Standby on the display panel does not disconnect DC or AC input power to the Freedom X 1200. If shore power is present at AC input terminals, it will pass through to the AC output.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

There are two tests to be performed. The first test verifies that the Freedom X 1200 is inverting DC battery power and delivering AC power to its output.

The second test is intended for installations where AC input and output is hard wired to the Freedom X 1200. This test verifies that the Freedom X 1200 transfers from inverter power to shore power when shore power is present.

NOTE: Shore power (pass-through) refers to the AC input power from a utility grid, generator or external AC source.

When you are ready to test your installation and operate the Freedom X 1200, close the DC fuse and Disconnect or the DC circuit breaker to supply DC power to the Freedom X 1200.

Testing in Battery Mode

To test the Freedom X 1200:

- For hard wired installations, ensure shore power is not present.
- 2. Press the Power button to turn the inverter on.
- 3. Connect a test load, such as a lamp within the power rating of the inverter into the Freedom X 1200 GFCI or an AC outlet hard wired to the Freedom X 1200.
- 4. Turn the lamp on to verify that it operates.

If the lamp operates, your installation is successful. If your installation has AC input and output hard wired to the Freedom X 1200, proceed to *Testing in AC Mode*.

If the status LED on the display panel glows red, see the Troubleshooting chapter.

Testing in AC Mode

To test the Freedom X 1200:

- With the test load from the previous test still connected and operating, connect the shore power source.
- The Freedom X 1200 transfers the test load to shore power. The green LED indicating AC mode turns on and the LCD screen displays the AC MODE icon.
- If the test load operates, your installation is successful.

NOTE: If the Power button on the Freedom X 1200 is turned ON, the Freedom X 1200 will automatically supply the appliances with inverter power if the shore power source fails or becomes disconnected.

If the Power button on the Freedom X 1200 is turned ON and shore power voltage is too low (less than 90 volts AC), the unit will transfer to inverter power (Battery Mode) to continue running your appliances.

NOTE: Whether or not the Power button is turned ON, shore power will pass through the Freedom X 1200 to the output when shore power is within normal operating range.

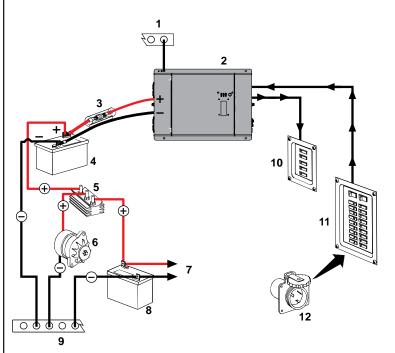
NOTE: In the event of low or no battery voltage, shore power will pass through the Freedom X 1200 to the output even when shore power is outside the normal operating range.

Marine Installation

Figure 18 illustrates a typical marine installation with the following components:

1	DC Equipment ground – Engine negative bus / DC ground bus
2	Freedom X 1200
3	DC fuse/disconnect/DC circuit breaker
4	12V deep cycle battery [house]
5	Battery isolator
6	DC alternator
7	To engine
8	DC Equipment ground – Engine negative bus / DC ground bus
9	Starting battery
10	AC load panel with branch circuit breakers that supply only loads that run off the Freedom X 1200
	AC source panel that includes a max 30A (or a 15A if using a GFCI) circuit breaker that supplies the Freedom X 1200
11	IMPORTANT
	To the installer: Affix the provided safety label to the source panel where the Freedom X 1200 will be connected to.
12	Shore power – AC power supplied from a shore power connector
Not shown	Drip shield (see next page)

Figure 18 Typical Marine Installation



Drip Shield Installation

The drip shields help to protect the unit from dripping or splashing liquids, which will cause a shock hazard when moisture comes in contact with electrical circuits in the unit. The drip shields are especially useful in marine installations where water from condensation, rain, or sea may come into contact with the Freedom X 1200.

AWARNING

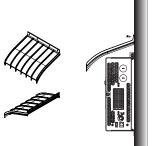
ELECTRICAL SHOCK HAZARD

Place this unit in normally dry areas only. Operating the unit under wet conditions may expose you to a shock hazard. Installing drip shields may not entirely protect you from this hazard. Do not operate the unit when it is wet.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

You may purchase the drip shield set by contacting customer support. When ordering, mention part number 808-1050.

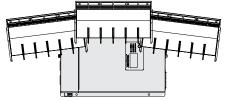
Figure 19 Drip shields



To install the drip shields:

- Gather the four screws needed to fasten a single drip shield to a wall.
- Locate an appropriate setting for the drip shields above the Freedom X 1200 making sure you cover the entire width of the unit.
 - You can overlay the shields as shown in *Figure 20*.
- Fasten the screws through the holes in the drip shield into the wall. See Figure 19.

Figure 20 Typical Drip Shield Placement on a Freedom X 1200



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4 OPERATION

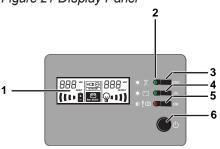
This section includes descriptions of the different modes and settings of the Freedom X 1200 -120V Sine Wave Inverter. This section includes:

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Freedom X 1200 Display Panel





1	LCD screen				
2	Status LE	ED indicators			
3	ESC	Return to default screen or exit setting mode.			
4	\triangle	Scroll to next screen or next selection.			
		Press and hold for three seconds to scroll back one step.			
5	To enter the Configuration mode or to confirm setting.				
6	Turns on inverter operation or to Standby.				

NOTE: Briefly pressing any function button activates backlight illumination. After 60 seconds of inactivity, backlight illumination turns off.

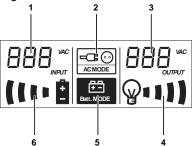
Status LED Indicators

Indicator	Definition
* # □ ← * □ ○ *! □ ○	Solid green. Indicates AC mode in which shore power is available and passing through to the loads.
* ↑ ○ * □ ● ← *! □ ○	Solid green. Indicates Battery mode (Inverter mode) in which the inverter is running and supplying power to the loads from the battery.
* ↑ ○ * □ ○ *! □ ● ←	Solid red. Indicates error or fault mode and is accompanied by an error code displayed on the LCD screen. For a list of error codes, see <i>Motor Loads on page 89</i> .
* # □ * □ Q *! □ ★	Flashing red. Indicates a Warning condition and is accompanied by an error code and a sounding alarm. For a list of error codes, see <i>Motor Loads on page 89</i> .

LCD Screen

The LCD Screen changes depending on the operating mode of the inverter.

Figure 22 Parts of the LCD Screen



1	AC IN level (source voltage) in Battery mode. Displays the Setting number in Configuration mode.	4	load level indicator (4 levels)
2	AC mode indicator - turns on when AC shore power is available as input and the power is passing through as output.	5	Battery (Inverter) mode indicator - turns on when the inverter is running and supplying power to the loads from the battery.

3	AC OUT level (output	6	battery level indicator (5
	voltage)		levels)
	Displays Error code when error or fault condition is detected.		
	Displays the Setting value in Configuration mode.		

975-0767-01-01

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LCD Screen Icons

Icon	Definition
((1)	Appears in all modes. Indicates ~ 75–100% battery capacity.
(1)	Appears in all modes. Indicates ~ 50–75% battery capacity.
11 🖺	Appears in all modes. Indicates ~ 25–50% battery capacity.
ı	Appears in all modes. Indicates ~ 1–25% battery capacity.
Ê	Appears in all modes. Indicates 0% battery capacity.
	Appears in AC mode only and sometimes in Fault mode. Indicates ~ 75–100% load capacity.

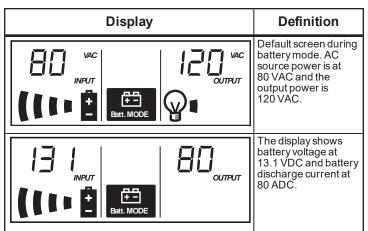
Icon	Definition
W 111	Appears in AC mode only and sometimes in Fault mode. Indicates ~ 50–75% load capacity.
	Appears in AC mode only and sometimes in Fault mode. Indicates ~ 25–50% load capacity.
	Appears in AC mode only and sometimes in Fault mode. Indicates ~ 0–25% load capacity.
AC MODE	Indicates AC mode in which shore power is available and passing through to the loads.
+ - Batt. MODE	Indicates Battery mode (Inverter mode) in which the inverter is running and supplying power to the loads from the battery.

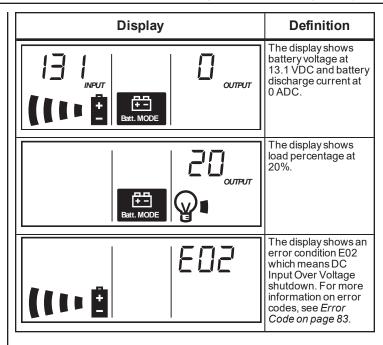
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Viewing Information During Battery Mode

The LCD screen displays information related to battery mode operation.

Press the Scroll button to move from screen to screen.
 Press and hold for three seconds to go back one step.

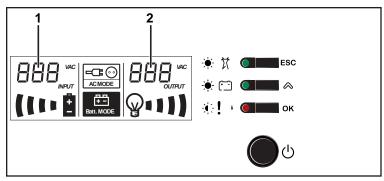




Adjusting Settings in Configuration Mode

The OK, Scroll , and ESC buttons can be used to cycle through the various settings:

- Press and hold the OK button for three seconds to enter Configuration mode and change general settings. Press the OK button to enter sub-settings, if applicable.
- 2. Press the Scroll button to scroll through the different settings. Press and hold for three seconds to scroll back one step.



	1	setting number is displayed here
ľ	2	setting value is displayed here

To change the default value to a different value:

- 1. Press and hold the OK button for three seconds to enter the Configuration mode.
- Press the Scroll button to scroll through the different settings. Press and hold for three seconds to scroll back one step. See Settings on page 67.
- 3. Press the OK button to select a general setting and change its value.
- 4. Press the Scroll button to change the value until you reach the desired value. Press and hold for three seconds to scroll back one step.
- 5. Press the OK button to confirm the change.
- 6. Repeat the previous steps to set other settings.
- 7. Press the ESC button to exit the Configuration mode.

Settings

Setting (with default values)	LCD Screen (Left Side)	LCD Screen (Right Side)	Range of values	Description
Exit Mode	00	ESC	n/a	
Power Save Timer	02	25	1 to 25	When the load is 50 watts or under, this value represents the number of hours inverter operation is going to continue before it is automatically turned off to preserve the battery.
			OFF	Power save time setting is OFF.
Load Sensing	03	di 5	EnA	Feature is enabled. See Power Save Mode on page 71.
			di 5	Feature is disabled.
LBCO Voltage Setting	04	105	10.5 to 12.1 V	This range is from 10.5 to 12.1 volts with increments of 0.1.
LBCO Shutdown Delay	05	300	I to 300 seconds	This range is from 1 to 300 seconds with increments of 1 (from 1 to 20) then increments of 10 (from 20 to 300).
Ignition Control	06	OFF	ALO LOE OFF	See Description of Ignition Control Features on page 56.

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Setting (with default values)	LCD Screen (Left Side)	LCD Screen (Right Side)	Range of values	Description
Transfer Mode	רם	APL	APL .	This default setting is for typical household appliances. It allows the transfer of shore power (AC MODE) to the loads from battery power (Batt. MODE) within 20 milliseconds and vice versa.
			UP5	This faster setting is for sensitive digital equipment like desktop computers. The transfer time is similar to a UPS in which it allows the transfer of shore power (AC MODE) to the loads from battery power (Batt. MODE) within 10 milliseconds and vice versa.
Output Frequency	08	60	60 Hz	This default AC output frequency setting of 60 Hz is commonly used in North American jurisdictions.
			50 Hz	This AC output frequency setting of 50 Hz is used in jurisdictions such as in some Latin American countries operating from 115 VAC/50 Hz. If the utility and inverter are set to 50 Hz, load appliances must also be rated to operate from 115 VAC/50 Hz power.

Setting (with default values)	LCD Screen (Left Side)	LCD Screen (Right Side)	Range of values	Description
Alarm Buzzer	09	b0n	60n	Audible
			60F	Silent
Reset to Factory Default	19	dEF	n/a	
Firmware version	ШТ		n/a	

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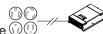
Operating in Battery Mode

The Freedom X 1200 is in Battery Mode (also called Inverter Mode) when all the following conditions exist:

inverter power button is ON ignition auto-on is activated



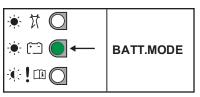
(down position) or



■ shore power is not presently available 🛈 🤄

battery has sufficient power

Inverter operation means that DC battery power is presently being converted to utility grade AC power, powering equipment and appliances connected to the AC output terminal of the unit. The green status LED lights up to indicate the Freedom X 1200 is using the battery to power the equipment and appliances.



Turning Inverter Operation ON

There are two ways to operate the Freedom X 1200's inverter function.

- 1. Press the Power button to a down position (it is in Standby in the up position).
- 2. When the inverter's Ignition Control feature is set to Auto-on $(ALD)^a$, a +12VDC signal is present on the ACC input^b.

AWARNING

ELECTRICAL SHOCK HAZARD

Turning the Power \odot button to Standby does not disconnect DC battery power from the Freedom X 1200. You must disconnect from all power sources before working on any circuits connected to the unit.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

To prevent unnecessary battery discharge, press the Power button to Standby when you are not using the Freedom X 1200.

^aSee Adjusting Feature Settings in Configuration Mode.

bWhen the vehicle's ignition switch is On or the vehicle's engine is running.

Power Save Timer

The Power Save Timer is an adjustable countdown timer from 1 to 25 h (25 h is the default) that automatically shuts down inverter operation to reduce battery discharge and preserve battery life. During continuous inverter operation, the countdown is initiated when power from the AC load drops to less than approximately 50 W and remains below this level. After reaching the end of the countdown timer the inverter automatically shuts down.

To change the countdown timer, see Settings on page 67.

Power Save Mode

By enabling the power save mode, also called load sensing, the inverter can automatically go to power save mode by sending short pulses to further reduce the battery discharge. Power save mode ends when a load greater than 25 W is connected.

NOTE: Certain types of loads can cause power save mode to work unexpectedly. These types of loads are described in *Problem Loads on page 90*.

Checking Battery Status

During inverter operation (in battery mode), you can check the battery status by observing the battery capacity indicator on the LCD screen. The battery voltage appears in the left side of LCD screen.

The normal operating battery voltage range is between 11 and 15 volts.

Checking Output Power

When the inverter is in operation (in battery mode), you can check how much power (displayed in kW) the Freedom X 1200 is supplying to the connected loads by observing the load capacity indicator on the LCD screen. The battery discharge amperage appears in the right side of the LCD screen.

Operating Several Loads at Once

If you are going to operate several loads from the Freedom X 1200, turn them on one at a time after you have turned the inverter on.

Turning loads on separately helps to ensure that the inverter does not have to deliver the starting current for all the loads at once, and will help prevent an overload shutdown.

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Turning the Audible Alarm ON or OFF

The Freedom X 1200's audible alarm can be muted. See *Adjusting Feature Settings in Configuration Mode*. See *Adjusting Settings in Configuration Mode on page 66*.

Any warnings such as error or fault conditions or imminent shutdown are both displayed on the LCD screen and sounded on the alarm speakers. See *To manually reset the alarm: on page 72*.

Audible alarm for warning: The unit beeps once when a warning condition is detected.

Audible alarm for error: The unit beeps once every 5 s for 1 min.

To mute the alarm:

Press any one of the three function buttons.

The alarm is automatically muted after 1 min. But the error code continues to be displayed until the error is cleared.

To manually reset the alarm:

- Press the Power button to turn it to Standby (from a down position to up) and press again to turn it On to reset an active alarm and clear the error.
- 2. If the Inverter Ignition Control is set to auto-on, toggle the ignition signal to clear the alarm and error.
- Toggle the AC input power to force the transition between AC mode and battery mode. This action clears the alarm and error.

Operating During Transition Between AC Mode and Battery Mode

The Freedom X 1200's advanced power management is capable of transitioning power from an AC source to DC source within a fraction of a second and vice-versa.

The Freedom X 1200 automatically detects when shore power is present and when it becomes unavailable or drops to less than 106 volts AC.

The transfer time can be set to two settings. For details see *Adjusting Settings in Configuration Mode on page 66*.

NOTICE

EQUIPMENT DAMAGE

- When the transfer mode is set to UP5, connect only sensitive digital equipment that requires fast AC transfer times.
- Appliances with motors, compressors, and heating elements do not require a transfer mode of UP5. Set RPL for these devices to avoid damaging the transfer relay.

Failure to follow these instructions can result in equipment damage.

Transitioning from AC Mode to Battery Mode

When the unit is operating in AC mode and shore power is lost, the Freedom X 1200 has less than 20 milliseconds (default is RPL) to switch to operating in battery mode (if the Power button is pressed in the On position) and starts drawing power from the battery.

The operating mode indicator will change to Battery Mode and the green Status LED for Battery Mode will light up.

However, if the Power button is in Standby, this transition does not happen and the display panel turns off.

Transitioning from Battery Mode to AC Mode

When the unit is operating in Battery Mode and shore power becomes available, the Freedom X 1200 begins a 20-second countdown to verify the stability of the shore power. If shore power remains stable for a 20-second countdown, at the end of the countdown, the Freedom X 1200 will switch to (shore power) AC mode within 20 milliseconds and start drawing power from the AC source.

The operating mode indicator will change to AC mode and the green Status LED for AC mode will light up.

Operating Limits

These are the operating limits of the Freedom X 1200:

- Power Output
- Input Voltage
- Overload Conditions
- High Surge Loads
- Over-temperature Conditions

Power Output

The Freedom X 1200 can deliver up to 1200 W of continuous utility grade sine wave AC power. The wattage rating applies to resistive loads such as a portable electric heater.

Input Voltage

The allowable Freedom X 1200 input battery voltage ranges are shown in the following table:

Table 11 Input battery voltage range

Operating Condition	Battery Voltage	Comment
Full Operating Range	LBCO – 16.5 V	Assuming the battery is full, the inverter will operate until battery voltage goes past below LBCO° and LBCO Shutdown delay timer ^d .
Low Voltage Recovery	< LBCO+0.5 V	Inverter is able to recover and continue to operate.

Operating Condition	Battery Voltage	Comment
Low Voltage Shutdown	< LBCO	The buzzer sounds a single 1 s low battery alarm beep and the LCD screen shows error code ED I. After LBCO Shutdown delay timer runs out, the unit shuts down inverter output. The buzzer stops beeping and the LCD screen shows error code ED I.
Instant Low Voltage Shutdown	< 10.2 V	After 2 s below the limit, the unit shuts down inverter output completely. LCD screen turns off completely.

c To set LBCO, see Adjusting Settings in Configuration Mode on page 66.

d To set LBCO Shutdown Delay Timer, see Input Voltage on page 75.

Operating Condition	Battery Voltage	Comment
High Voltage Shutdown	16.7 V	The display shows error code EB2 alternating with the battery voltage. The red status LED turns on.

Overload Conditions

There are two kinds of overload conditions – an overload warning and an overload shutdown.

Overload When the Freedom X 1200's AC load is approximately
Warning
100 W below the overload shutdown limit of rated watts,
the audible alarm beeps once and the LCD screen
shows a warning code ₹□5.

Overload When the Freedom X 1200's AC load increases to near Shutdown ~1300 W, the audible alarm beeps every five seconds for one minute and the LCD screen shows a error code ED3. The Status LED turns solid RED.

High Surge Loads

Some induction motors used in freezers, pumps, and other motoroperated equipment require high surge currents to start. The Freedom X 1200 may not be able to start some of these motors even though their rated steady state current draw is within the inverter's limits. The unit will shut down and indicate an overload shutdown.

Over-temperature Conditions

During inverter operation, when the Freedom X 1200's internal temperature starts to approach its preset shutdown limit, the display will show error code £07. If the over-temperature condition persists, the display will show error code £04. The Status LED turns solid RED and the inverter will shut down to prevent damage to the inverter and protect the battery from being over-discharged. However, when the internal temperature drops and falls within normal operating temperature, the Freedom X 1200 will recover automatically and will continue inverting.



5 ROUTINE MAINTENANCE

Regular maintenance is required to keep your Freedom X 120)(
operating properly. This section includes:	

Maintaining th	e Freedom X	1200 Unit	.79
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Maintaining the Freedom X 1200 Unit

AWARNING

ELECTRICAL SHOCK HAZARD

Turning the Power (b) button to Standby does not disconnect DC battery power and AC source power from the Freedom X 1200. You must disconnect from **ALL** power sources before working on any circuits connected to the unit.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Periodically you should:

- With all sources of power off, clean the exterior of the unit with a damp cloth to prevent the accumulation of dust and dirt.
- Ensure that the DC cables are secure and fasteners are tight.

Make sure the ventilation openings are not clogged.



6 TROUBLESHOOTING

This section will help you narrow down the source of any problem you encounter. Before contacting customer service, please work through the steps listed in *Pre-service Checklist on page 81*. This section includes:

Pre-service Checklist	81
Warning Messages	82
Troubleshooting Reference	85
Inverter Applications	89
Resistive Loads	89
Motor Loads	89
Problem Loads	90

Pre-service Checklist

AWARNING

ELECTRICAL SHOCK HAZARD

Do not disassemble the Freedom X 1200. It does not contain any user-serviceable parts. Attempting to service the unit yourself could result in an electrical shock or burn.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: To obtain service go to *Contact Information on page 2*. Prior to obtaining service, see below:

- Check for any error codes displayed on the LCD screen. If a message is displayed, record it before doing anything further.
- As soon as possible, record the conditions at the time the problem occurred so you can provide details when you contact customer service for help. Include the following information:
 - What mode the unit was on when the problem occurred—inverter/battery, shore, or charger modes
 - What loads the Freedom X 1200 was running or attempting to run
 - What the battery condition was at the time (voltage, etc.) if known

- Recent sequence of events
- Any known unusual AC shore power factors such as low voltage, unstable generator output, etc.
- Whether any extreme ambient conditions existed at the time (temperature, vibrations, moisture, etc.)
- If your Freedom X 1200 is not displaying an error code, check the following to make sure the present state of the installation allows proper operation:
 - Is the inverter located in a clean, dry, adequately ventilated place?
 - Are the battery cables adequately sized as recommended in the Installation guide?
 - Is the battery in good condition?
 - Are all DC connections tight?
 - Are the AC input and output connections and wiring in good condition?
 - Are the configuration settings correct for your particular installation?
 - Are all disconnects and AC breakers closed and operable?
 - Have any of the fuses/circuit breakers blown in the installation?
- Contact customer support for further assistance. Please be prepared to describe details of your system installation and to provide the model and serial number of the unit.

Warning Messages

Warning messages in the form of audible alarms and error codes that appear on the LCD screen to alert you to an impending system change. Warnings do not affect operation.

With the exception of the error codes displayed on the screen, only the audible alarm can be turned ON or OFF. Follow the steps in *Turning the Audible Alarm ON or OFF on page 72* to change the alarm settings.

The error codes are listed in *Table 12*. The text in the **Error Code** column appears on the LCD screen of the display panel.

Table 12 Error codes displayed on the LCD screen

Error Code	Condition	Mode	Action
E0 I	Low battery voltage shutdown is imminent depending on the setting, see Maintaining the Freedom X 1200 Unit on page 79.	Battery mode (inverting)	Check battery status and recharge if necessary. Check for proper DC cable sizing. Check for loose connections and tighten if necessary.
E02	High battery voltage shutdown > 16.7 V===	Battery mode (inverting)	Check for external charging sources, such as a PV charger and an over voltage alternator. Disconnect, if necessary.
E03	AC output overload shutdown	Battery mode (inverting)	Reduce the loads connected to the AC outlet of the unit. Check appliances that have high-surge ratings and disconnect if necessary.
E04	Over-temperature shutdown	Battery mode (inverting)	Reduce the loads connected to the AC outlet of the unit. Check that the ventilation grille is not blocked. Check for ambient temperature and move the unit to a cooler location whenever possible.
E06	AC output overload warning	Battery mode (inverting)	Reduce the loads connected to the AC outlet of the unit.

Warning Messages

Error Code	Condition	Mode	Action
EO7	Fan lock alarm	Battery mode (inverting)	Check the fan for any obstruction and remove it. Large debris which may enter through the fan grille may impede the fan blades from turning. When removing debris, do not insert your fingers inside the grille. Remove power from the inverter first before attempting to remove the debris.
E8 to E 10	General error detected	Battery and other modes	Check the fan for any obstruction and remove it. If there is no issue with the fan, disconnect the unit from its DC and AC power sources, then reconnect, and then restart the unit. Perform Connecting to the Remote Port on page 56. If error detection persists, contact customer service.

For error code EDI, after the LBCO shutdown delay, the unit will immediately stop inverting. For error codes EDI to EDII, the unit will stop inverting.

Troubleshooting Reference

AWARNING

ELECTRICAL SHOCK HAZARD

Do not disassemble the Freedom X 1200. It does not contain any user-serviceable parts. Attempting to service the unit yourself could result in an electrical shock or burn.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE

INVERTER DAMAGE

Avoid continually overloading the inverter and subjecting it to over temperature conditions. Although provided with integral protection against overloads continual overloading can damage the circuitry.

Failure to follow these instructions can result in damage to the inverter.

Table 13 Troubleshooting reference

Problem	Possible Cause	Solution	
Alarm does not sound when an error is encountered.	Alarm is turned OFF.	See <i>Turning the Audible Alarm ON or OFF on page 72</i> and follow instructions to turn the alarm buzzer on again.	
No output voltage. The status LED is red.	AC shore power is not available or out of operating range and the inverter has shut down with the LCD screen showing one of the following error codes:		
		Verify the unit is connected to a 12V battery.	
	Low input voltage (error code E0 I)	Check the DC connections and the cable.	
		Recharge the battery.	
	High input voltage (error code E□2)	Verify the unit is connected to a 12V battery.	
		Check the voltage regulation of the external charging system (if any).	
	Unit overload or AC output short circuit (error code ED3)	Reduce the load. Make sure the load does not exceed the output rating.	
	Thermal shutdown (error code EDH)	Allow the unit to cool off.	
		Reduce the load if continuous operation is required.	
		Improve ventilation. Make sure the inverter's ventilation openings are not blocked.	

Problem	Possible Cause	Solution
No output voltage is shown in the LCD screen but the green status LED for Battery mode is illuminated.	Circuit breaker on the AC load panel or AC output disconnect has tripped.	Reset the circuit breaker or check the AC output disconnect circuits.
	Battery voltage is too low (depending on setting, see Maintaining the Freedom X 1200 Unit on page 79) to start inverting. LCD screen may show DC voltage as 000.	Check DC connections and cable. Recharge battery.
	GFCI (when installed) has tripped or supplementary breaker has tripped.	Check load and reset the GFCI or supplementary breaker.
No output voltage is shown in the LCD screen and neither of the green status LEDs (for AC mode and Battery mode)	AC shore power is not available or out of operating range and the inverter is OFF.	Check AC shore power. Turn the inverter ON.
is illuminated.	AC shore power is not available and the inverter is OFF due to a shutdown for more than 30 s.	Check AC shore power and battery voltage. Turn the inverter ON and look at the LCD screen for any error code. See Error codes displayed on the LCD screen on page 83.

Troubleshooting Reference

Problem	Possible Cause	Solution
No output voltage. The status LED is not lighting up.	Ignition lock (ACC) signal is not present.	If the ignition control feature is in use, ensure the vehicle's ignition is On and the ignition control switch on the front of the Freedom X 1200 unit is On ().
The fan turns on and off during AC shore power mode.	The battery is discharged. AC pass-through current is high.	Do not be alarmed, the unit is performing normally.
The fan turns on and off during inverter mode.	The inverter is running continuously at high power.	Do not be alarmed, the unit is performing normally. The fan is activated automatically.

Inverter Applications

The Freedom X 1200 performs differently depending on the AC loads connected to it. If you are having problems with any of your loads, read this section.

Resistive Loads

These are the loads that the inverter finds the simplest and most efficient to drive. Voltage and current are in phase (that is, in step with one another). Resistive loads usually generate heat in order to accomplish their tasks. Toasters, coffee pots, and heater elements are typical resistive loads. It is usually impractical to run larger resistive loads—such as electric stoves and water heaters—from an inverter due to their high current requirements. Even though the inverter can most likely accommodate the load, the size of battery bank required would be impractical if the load is to be run for long periods.

Motor Loads

Induction motors (that is, motors without brushes) require two to six times their running current on start up. The most demanding are those that start under load, for example, compressors and pumps. Of the capacitor start motors (typical in drill presses, band saws, etc.), the largest you can expect to run is ½ hp (the transfer relays are rated at 2 hp). Universal motors are generally easier to start. Since motor characteristics vary, only testing will determine whether a specific load can be started and how long it can be run. If a motor fails to start within a few seconds or loses power after running for a time, it should be turned off. When the inverter attempts to start a load that is greater than it can handle, it will turn itself off after a few seconds.

Long Transfer Times

The Freedom X 1200 may take a long time (~ 0.1–0.2 s) to transfer to Battery Mode when shore power is cut off while powering a motor load. Motor loads typically "freewheel" when power is removed (for example, a grinder) and causes a longer transfer time. The longer transition from shore power to inverter power may cause connected computers or other sensitive equipment to operate incorrectly. To avoid this effect, do not connect motor loads together with sensitive equipment to the inverter for power.

Problem Loads

Very Small Loads If the power consumed by a device is less

than the 25-watt threshold of the power save mode circuitry, and power save mode is enabled, the Freedom X 1200 will not run. Most likely the solution will be to disable power save mode.

Fluorescent Supplies

Some devices cannot be detected when load Lights and Power sensing. Small fluorescent lights are the most common example. Some computers and sophisticated electronics have power supplies that do not present a load until line voltage is available. When this occurs, each unit waits for the other to begin. To drive these loads, either a small companion load like a light bulb rated for more than 25 W must be used to bring the Freedom X 1200 out of power save mode, or the Freedom X 1200 may be programmed to remain on by disabling power save mode.

Clocks

You may notice that your clocks are not accurate. Some of the clocks on your appliances may reset when the Freedom X 1200 is in power save mode.

When the Freedom X 1200 is in power save mode, it may fail to start some loads even though the rated wattage on the load is more than 25 W. If these kinds of loads are in the system, follow the suggestions given to eliminate the problem.

If the problem loads cannot be eliminated, there are two workaround solutions:

- 1. Disable power save mode from Settings on page 67, causing the Freedom X 1200 to always remain at full output voltage.
- 2. Use a search-friendly companion load whose only purpose is to be switched on to wake up the Freedom X 1200 to power the load that is unable to bring the Freedom X 1200 out of power save mode.

NOTES:

- Power save mode, by function, cannot work with clocks and timers or devices that need power 24 hours a day. Examples of devices with timers include cable TV boxes. coffee makers with brew timers, refrigerators, and freezers with defrost timers. Examples of devices that need power 24 hours a day include telephone answering machines, alarm systems, motion detection lights, and some thermostats
- When the Freedom X 1200 is load sensing the output for loads, lights that have a wattage lower than 25-watt threshold, may flash momentarily.



7 SPECIFICATIONS

This section summarizes the hardware and electrical specifications of the Freedom X 1200 -120V Sine Wave Inverter.

Physical Specifications	92
Environmental Specifications	. 92
System Specifications	. 93
Regulatory Approvals	94

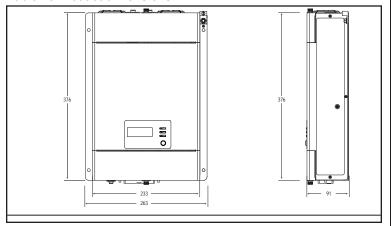
NOTE: Specifications are subject to change without prior notice.

Physical Specifications

Table 14 Physical specifications

	Freedom X 1200	
L×W×H	14.8" × 10.4" × 3.5" (376mm × 263mm × 91mm)	
	NOTE: Includes flanges.	
Net Weight	10.4 lbs (4.7 kg)	

Table 15 Product dimensions



Environmental Specifications

Table 16 Environmental specifications

	Freedom X 1200
Ambient Temperature:	
Operating Temperature Range ^a	-4 –140 °F (-20 –60 °C), with output derated above 104 °F (40 °C)
Storage Temperature Range	-40 –158 °F (-40 –70 °C)
Humidity: Operation/Storage	5–95% RH, non-condensing

aOperation may be limited based on the battery chemistry. For example, Lithium Iron Phosphate batteries have a limited temperature range. Follow specific battery manufacturer recommendations for the applicable chemistry.

System Specifications

Table 17 System specifications

	Freedom X 1200
Transfer relay rating (A ^a)	30A surge (24A continuous)
Transfer time (milliseconds ^b)	
Shore to inverter:	<20 milliseconds
Inverter to shore:	<20 milliseconds with a 20-
	second delay
Transfer voltage (V)	
Shore to inverter:	<95 V and >135 V
Inverter to shore:	<130 V and >100 V
	Fan, activated by any of the
Cooling	following:
Cooling	High internal temperature
	High AC output power

Table 18 DC input for inverting

	Freedom X 1200
Operating voltage range	LBCO voltage ^a –16.5 VDC
Maximum non-operating voltage	0-24 VDC
Nominal voltage	12.0 VDC
Nominal current at full load	116 ADC

Table 19 AC output for inverting

	Freedom X 1200
Output voltage options	110–125 VAC
Continuous power ^b	1200 W @ 25 °C
Continuous current	10 A
Surge power (5 sec)	2400 W
Frequency	60 (or 50) Hz
GFCI protection ^c	customer-provided
Wave shape	True Sine Wave
Peak efficiency	91%
Full load efficiency	≥ 86%

a Circuit breakers shall not carry more than 80% of their UL current rating continuously.

b To change the AC Transfer time (mode), see Adjusting Settings in Configuration Mode on page 66.

^aTo set LBCO, see Adjusting Settings in Configuration Mode on page 66.

^b Power derates to 85% when output voltage is set to 110/108 VAC. .

^c See Ground Fault Circuit Interrupters (GFCIs) on page 30 for approved device/s.

Regulatory Approvals

Table 20 Regulatory approvals

	Freedom X 1200
	ETL-listed complies to CSA 107.1 UL458 and UL458 Marine
Product Safety	Supplement (drip shield with product number 808-1050 required)
	ABYC E-11, A-31, A-32
EMI	CFR 47, (FCC Part 15) Subpart B, Class B
	ISED CAN ICES-3(B)/NMB-3(B)



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